# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/844,345 | 04/27/2001 | Arch D. Robison | 42390P10802 | 3295 |

| | | | EXAMINER |
|---|---|---|---|
| 8791 | 7590 | 06/18/2004 | KANG, INSUN |

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| ART UNIT | PAPER NUMBER |
|---|---|
| 2124 | |

DATE MAILED: 06/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
| **Office Action Summary** | 09/844,345 | ROBISON, ARCH D. |
| | Examiner | Art Unit |
| | Insun Kang | 2124 |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)☒ Responsive to communication(s) filed on *27 April 2001 and 08 April 2002*.

2a)☐ This action is **FINAL**.    2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All    b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date *4/8/2002*.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 1-04)        Office Action Summary        Part of Paper No./Mail Date 06092004

## DETAILED ACTION

1.  This action is responding to application papers dated 4/27/2001 and 4/8/2002.

2.  Claims 1-38 are pending in the application.

### *Specification*

3.      The following guidelines illustrate the preferred layout for the specification of a
utility application.  These guidelines are suggested for the applicant's use.

#### Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should
include the following sections in order.  Each of the lettered items should appear in
upper case, without underlining or bold type, as a section heading.  If no text follows the
section heading, the phrase "Not Applicable" should follow the section heading:

      (a) TITLE OF THE INVENTION.
      (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
      (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
          DEVELOPMENT.
      (d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A
          COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05.  Computer
          program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)),
          and tables having more than 50 pages of text are permitted to be
          submitted on compact discs.) or
          REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a).
          "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
      (e) BACKGROUND OF THE INVENTION.
          (1) Field of the Invention.
          (2) Description of Related Art including information disclosed under 37
          CFR 1.97 and 1.98.
      (f) BRIEF SUMMARY OF THE INVENTION.
      (g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
      (h) DETAILED DESCRIPTION OF THE INVENTION.
      (i) CLAIM OR CLAIMS (commencing on a separate sheet).
      (j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
      (k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825.  A
          "Sequence Listing" is required on paper if the application discloses a
          nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if
          the required "Sequence Listing" is not submitted as an electronic
          document on compact disc).

A brief summary of the invention is missing in the specification.  See MPEP §
608.01(d).

### Claim Rejections - 35 USC § 112

4.      The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly
claiming the subject matter which the applicant regards as his invention.

5.      Claims 13, 27 and 37 are rejected under 35 U.S.C. 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention.

Per claims 13, 27 and 37, it is unclear to which first and second edges they are

referring.  They are interpreted as "the first and second edges."

### Claim Rejections - 35 USC § 101

6.      35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or
composition of matter, or any new and useful improvement thereof, may obtain a patent therefor,
subject to the conditions and requirements of this title.

7.      Claims 1-14 are rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter.

Claims 1-14 are non-statutory because they are directed to a "method" without

recitation of a computer or a computer-readable medium embodying the method.  The

claims merely recite a "method" that is disembodied arrangement so as to be called a

"computer program" or compilation of facts, information, or data *per se*, without creating

any functional interrelationship, either as part of the stored data or as part of the

computing processes performed by the computer ("acts") or computer readable medium

so as to enable the computer to perform the claimed steps of pruning local graphs as

recited.

Thus the claims represent functional descriptive material that is not capable of

producing a useful result, and hence represent only abstract ideas. Therefore, the

claims are non-statutory.


### Claim Rejections - 35 USC § 102

8.      The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9.      Claims 1-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Ruf (US

Patent 6,077,313).

Per claim 1:

Ruf discloses:

pruning local graphs representing local problems ("A partitioning algorithm transforms

the dependence relation by merging mutually dependent types in the dependence

relation into single type representatives so mutually dependent program quantities will

be analyzed in the same phase and therefore simultaneously by the dataflow analysis,"

col. 7 lines 25-33; col. 9 lines 40-48), the local problems corresponding to separately

compilable components in a software program, each of the local graphs having edges

and vertices, each edge having a transfer function, each vertex having a value

("Dependence analysis module ... represents each type in the dependence relation

with a vertex or node in dependence graph ... and represents the dependence

between each pair of types with a directed edge from the node representing the

dependent type to the node representing the type upon which the dependent type

depends. Each node in dependence graph ... may be labeled with the type

represented by the node," col. 9 lines 40-48), values of each of the local graph forming

a lattice under a partial ordering ("Each node of the collapsed dependence graph

represents a type representative, and the resulting dependence graph is a directed

acyclic graph (DAG) corresponding to a partial ordering of type representatives," col.

10 lines 1-10)

as claimed.


Per claim 2:

The rejection of claim 1 is incorporated, and further, Ruf discloses:

-associating a use attribute to each one of the vertices in each of the local graphs, the

use attribute being asserted for each vertex reachable from a named vertex; associating

an affect attribute to each one of the vertices in each of the local graphs, the affect

attribute is asserted for a vertex if a named vertex is reachable from the former vertex;

and pre-solving a subgraph of each of the local graphs (col. 12 lines 36-52), the

subgraph including subgraph edges, each of the subgraph edges connecting a tail

vertex to a head vertex, the tail vertex having a negated use attribute ("nodes 510, 520,

as nodes of a strongly-connected component, are therefore collapsed into a single

node... and directed edges...are removed to form a collapsed dependence graph," col.

12 lines 36-52) as claimed.


Per claim 3:

The rejection of claim 2 is incorporated, and further, Ruf discloses shrinking the local

graphs("nodes 510, 520, as nodes of a strongly-connected component, are therefore

collapsed into a single node... and directed edges...are removed to form a collapsed

dependence graph," col. 12 lines 36-52) as claimed.

Per claim 4:

The rejection of claim 3 is incorporated, and further, Ruf discloses

- solving a global problem to optimize a recompilation of the separately compilation

components by an inter-procedural analysis (IPA) solver, the global problem being

represented by a global graph formed from the pruned local graphs ("For

interprocedural data flow analyses, the dataflow solution for a function value

determines, and is determined by, control flow edges between procedures," col. 17 lines

43-50) as claimed.

Per claim 5:

The rejection of claim 4 is incorporated, and further, Ruf discloses

- determining final edges and vertex values of the local graphs to be sent to IPA solver;

and sending the final edges and vertex values to the IPA solver, the final edges and

vertex values forming the pruned local graphs("nodes 510, 520, as nodes of a strongly-

connected component, are therefore collapsed into a single node... and directed

edges... are removed to form a collapsed dependence graph," col. 12 lines 36-52) as

claimed.

Per claim 6:

The rejection of claim 2 is incorporated, and further, Ruf discloses

- negating use attributes for all vertices in the local graph; and invoking a mark use

operation on u for each named vertex u in the local graph (col. 12 lines 36-52) as

claimed.

Per claim 7:

The rejection of claim 6 is incorporated, and further, Ruf discloses

asserting the use attribute associated with u if the use attribute is negated; and

recursively invoking the mark use operation on v for each edge connecting the named

vertex u to a vertex v ("Dependence graph... therefore comprises directed edge... from

node... back to itself... nodes 510, 520, as nodes of a strongly-connected component,

are therefore collapsed into a single node... and directed edges... are removed to form a

collapsed dependence graph," col. 12 lines 10-52) as claimed.

Per claim 8:

The rejection of claim 2 is incorporated, and further, Ruf discloses

negating use attributes for all vertices in the local graph; invoking a mark affect

operation on y for each named vertex y in the local graph (col. 12 lines 1-2) as claimed.

Per claim 9:

The rejection of claim 8 is incorporated, and further, Ruf discloses

asserting the use attribute associated with y if the use attribute is negated; and

recursively invoking the mark affect operation on x for each edge connecting the vertex

x to a named vertex y (col. 12 lines 10-52) as claimed.

Per claim 10:

The rejection of claim 2 is incorporated, and further, Ruf discloses finding a greatest fix-

point solution to the subgraph (col. 15 lines 18-44) as claimed.

Per claim 11:

The rejection of claim 3 is incorporated, and further, Ruf discloses removing an

incoming edge having a head value of a lattice-bottom("Dependence graph...therefore

comprises directed edge...from node...back to itself...nodes 510, 520, as nodes of a

strongly-connected component, are therefore collapsed into a single node... and

directed edges...are removed to form a collapsed dependence graph," col. 12 lines 10-

52) as claimed.


Per claim 12:

The rejection of claim 3 is incorporated, and further, Ruf discloses transforming a

subgraph having first and second edges, the first and second edges having first and

second functions, the first edge connecting a first vertex to an anonymous vertex having

a value v, the second edge connecting the anonymous vertex to a second vertex having

a value w (col 15 lines 3-17) as claimed.

Per claim 13:

The rejection of claim 12 is incorporated, and further, Ruf discloses removing the

anonymous vertex; removing first and second edges; adding a third edge having a third

function and connecting the first and second vertices, the third function being combined

by the first and second functions; and changing value of the second vertex to a lattice

meet of the second function of the value v and the value w ("Dependence

graph...therefore comprises directed edge...from node...back to itself...nodes 510, 520,

as nodes of a strongly-connected component, are therefore collapsed into a single

node... and directed edges...are removed to form a collapsed dependence graph," col.

12 lines 10-52) as claimed.

Per claim 14:

The rejection of claim 15 is incorporated, and further, Ruf discloses determining each of

the final edges as edge having asserted use and affect attributes for tail and head

vertices, respectively; and eliding each of the vertex values having a top value (col. 12

lines 10-52) as claimed.


Per claims 15-28, they are the computer program product versions of claims 1-

14, respectively, and are rejected for the same reasons set forth in connection with the

rejection of claims 1-14 above.

Per claims 29-38, they are the system versions of claims 1-5 and 10-14,

respectively, and are rejected for the same reasons set forth in connection with the

rejection of claims 1-5 and 10-14 above.

10.    Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Insun Kang whose telephone number is 703-305-6465.

The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kakali Chaki can be reached on 703-305-9662.  The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system.  Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

Insun Kang
Patent examiner
6/10/2004

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